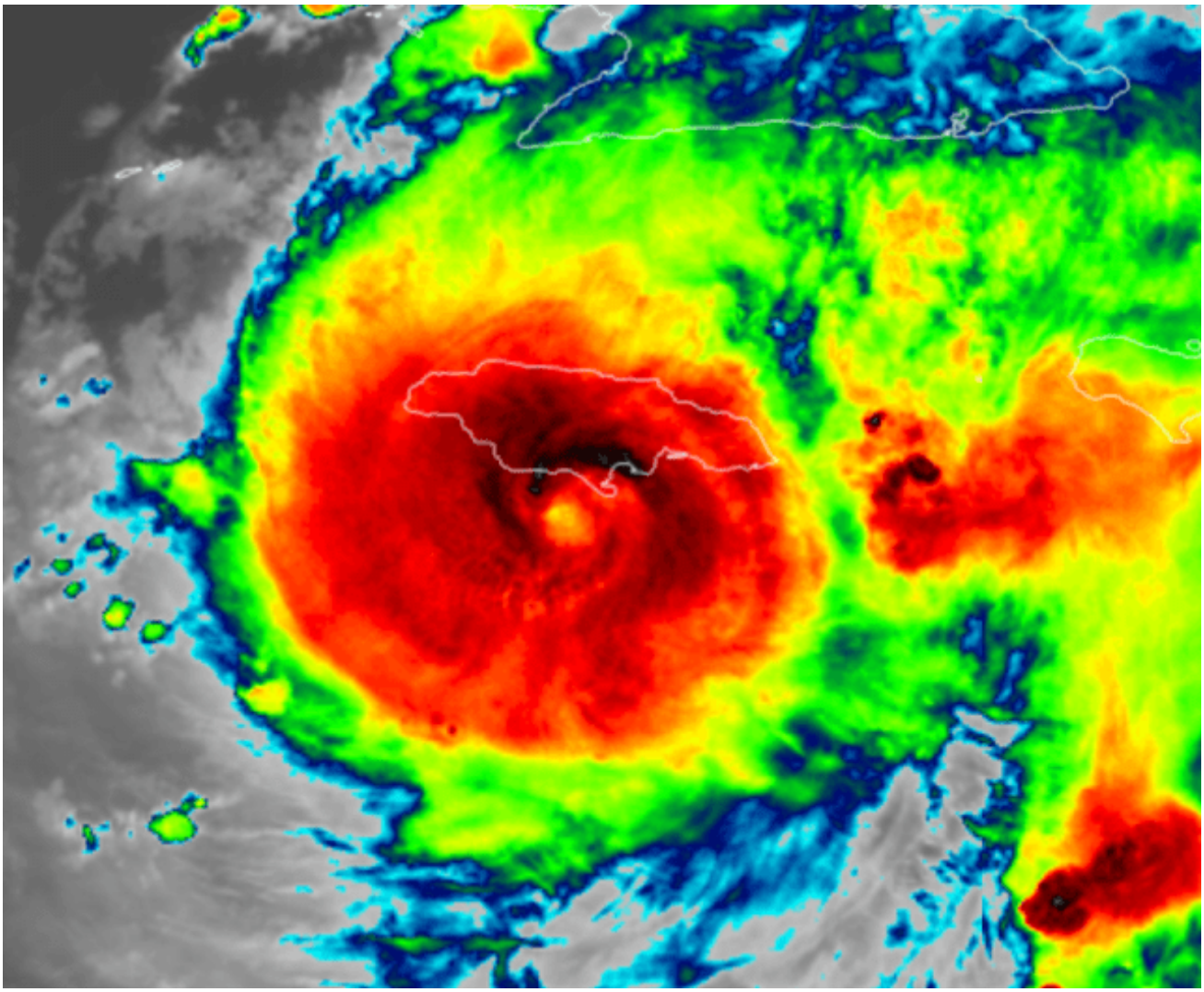
What has been driving Hurricane Beryl?

Description

Hurricane Beryl, which has been tearing through the Caribbean, has been hitting the headlines for several reasons.

Firstly, there is the undeniable fact that during her existence as a Category 4 and 5 hurricane Beryl caused much damage and loss of life across several nations and territories, including Grenada, St Vincent and the Grenadines, Jamaica and the British Overseas Territory of the Cayman Islands.



Satellite image of Hurricane Beryl crossing Jamaica in early July 2024

Secondly, Beryl has become infamous for being the earliest Category 5 hurricane in the historical record in the Atlantic Basin. Category 5 is the highest ranking for hurricanes requiring sustained wind speeds of at least 157 mph. Hurricane Beryl's wind actually peaked at 165 mph on 2 July. The earliest date in the year any previous Atlantic hurricane had achieved winds of this strength was a full month

later on 5 August.

Active hurricane season

Julian Heming is a Met Office tropical cyclone expert who has been studying these systems for many years. He said: “In the second half of May several prediction centres, including the Met Office, forecast an active Atlantic hurricane season with between 150% and 200% of usual activity.

“These Atlantic seasonal forecasts have been influenced by the development of cooler waters in the equatorial eastern Pacific in recent months – in line with the anticipated La Niña or cooler phase of the naturally-variable El Niño Southern Oscillation (ENSO) cycle.

“Developing La Niña conditions have a known association with a more active Atlantic hurricane season. So, we know that natural variation in the climate system has a huge observable effect on hurricane activity.

“But this trend towards La Niña favouring hurricane development would not solely explain Hurricane Beryl and the prediction of an active hurricane season.

“Sea temperatures across the tropical Atlantic and Caribbean Sea have been well above average since the Spring of 2023 which provides fuel for intense hurricanes like Beryl. There is much meteorologists do not yet understand about how these high sea-surface temperatures have developed and why they have persisted for so long. This is an active area of research.”

“Furthermore, higher sea-surface temperatures in line with a warming climate are expected to favour the development of a greater proportion of intense tropical cyclones in the long term.”

International effort

Will Lang is the Met Office’s head of Situational Awareness. He said: “Met Office forecasts are a crucial part of the international effort to predict Atlantic hurricanes, and our experts work at the heart of UK Government’s international response to damaging hurricanes such as Beryl.”

You can watch an interview about Hurricane Beryl here.

Date Created
July 2024

Unsettled weather continues – are there any signs of a change?

Description

As this week starts off on an unsettled note for the weather, some are wondering when we might see something a bit more ‘summer-like’ in the forecast, and why meteorological summer has got off to such a seemingly drab start.

This week’s weather forecast follows a similar theme to many in recent weeks. Low pressure with accompanying rain is the dominant force in the UK’s forecast, with weather warnings already issued and the possibility of further warnings for some through the next few days.

Jason Kelly is a Chief Meteorologist at the Met Office and said: “After a damp afternoon on Monday, a heavier band of rain moves in from the southwest in the evening, and as it moves northwards, the area of low pressure driving this rain becomes the dominant feature over the next few days. Yellow warnings have been issued, with the initial focus in the south, before spreading further north in the coming days.”

As we look further ahead, there is a signal towards drier conditions overall by the weekend and although there should be some sunny spells, there will still be showers in places with temperatures generally below average for the time of year.

What’s behind the recent weather?

According to provisional Met Office figures, June started meteorological summer on a cool note, despite a late-month warm spell.

When you include the first week of July to look at summer so far, that cool theme has continued, with recent daytime maximum temperatures generally in the high teens or low 20s Celsius, with frequent periods of cloud and rain subduing the feeling of the weather for many.

When looking at the underlying patterns behind the UK’s weather, the jet stream plays a prominent role and that has been the case in recent weeks, as Met Office Deputy Chief Meteorologist David Hayter explained.

“The position of the jet stream, which is a ribbon of air high up in the atmosphere, is often the driving force behind the weather we experience in the UK,” said David.

“Just small shifts in the position of the jet stream can lead to big differences in the weather we experience on the ground. In recent weeks, the jet stream has been either directed towards the UK, or shifted further south, which has predominantly brought cooler air over the UK, with frequent incursions of some unseasonable winds and rain.

“For warm weather in the UK in summer, you’d tend to see the jet stream shifted further north, which allows the possibility of warmer air to drift over the UK from the south, though this isn’t always the

case. Unfortunately for those who like the warmth, we have only had brief periods where this pattern has been present in summer so far."

Any warmth to come?

While there will be some sunny spells for some later this week, temperatures remain likely to be either slightly below or around average for the time of year recovering slightly through the weekend or early next week.

Global drivers of the UK's weather are somewhat weaker in meteorological summer, meaning that long-range forecasts come with some in-built uncertainty and can only talk about general trends in the outlook, despite the enthusiasm of some online newspaper headlines.

Met Office Deputy Chief Meteorologist David Hayter said: "While there's much uncertainty in the forecast at this range, there are some subtle signs of a more settled spell possibly developing, at least for a time, in the second half of July. It's far too early to give any details on how this could develop, so it's important to stay up to date with the latest forecast. There also remains an ongoing chance of unsettled periods of weather and much will depend on the dominant conditions day-to-day as the forecast takes shape."

Stay up to date with the latest in-depth forecasts and explanations on the Met Office's YouTube, which features in-depth explorations of the weather, as well as the outlook for the next ten days.

Date Created
July 2024

Changing Climatic Conditions of British Sporting Events under Increased Global Temperatures

Description

Anyone exploring the Met Office's UK Climate Projections (UKCP) for the first time is unlikely to be looking for long before coming across the phrase 'warmer, wetter winters; hotter, drier summers,' which describes, in a general sense, the changes we expect to see across the UK due to increased global temperatures. While this phrase has become somewhat of a mantra for some people in the climate science community, the effects of increased global temperatures on the climate of the UK are expected to be much more nuanced than can be conveyed in just six words.

This nuance continues to be well researched by scientists and there has been recent work aiming to convey this complexity in ways which are relatable to the British public. Some examples of this include work by scientists at the Met Office to produce a set of Future Forecasts to explore how Wimbledon and Glastonbury Festival may be affected by a heatwave in the 2050s. Similarly, BBC Sport's Sport 2050 looked at how the weather could impact sporting events across the world by 2050.

Expected future climatic conditions of popular UK sporting events

In this blog we look at a recent piece of work conducted at the Met Office which aims to build on these previous studies and explore the expected future climatic conditions of a number of popular sporting events spread across the country and throughout the year. These include the Great North Run (Newcastle in September), the first Test match at Edgbaston (Birmingham in June), the London Marathon (London in April) and the start of the Six Nations (February) at the Twickenham (London), Murrayfield (Edinburgh) and Principality (Cardiff) stadiums.

By exploring this range of events, which also includes a range of cultural and social events, this work aims to build a richer picture of the future climate and highlight changes to the climatology of events which take place outside of the British summer – the season which has been the focus of previous similar studies.

The above events were chosen due to their significance to large portions of the British public and, because they are outside, our experience of them is closely linked to the weather conditions at the time. Understanding changes to the climate of these events will give an insight into one way in which people's daily experiences and lifestyles are likely to be different because of climate change.

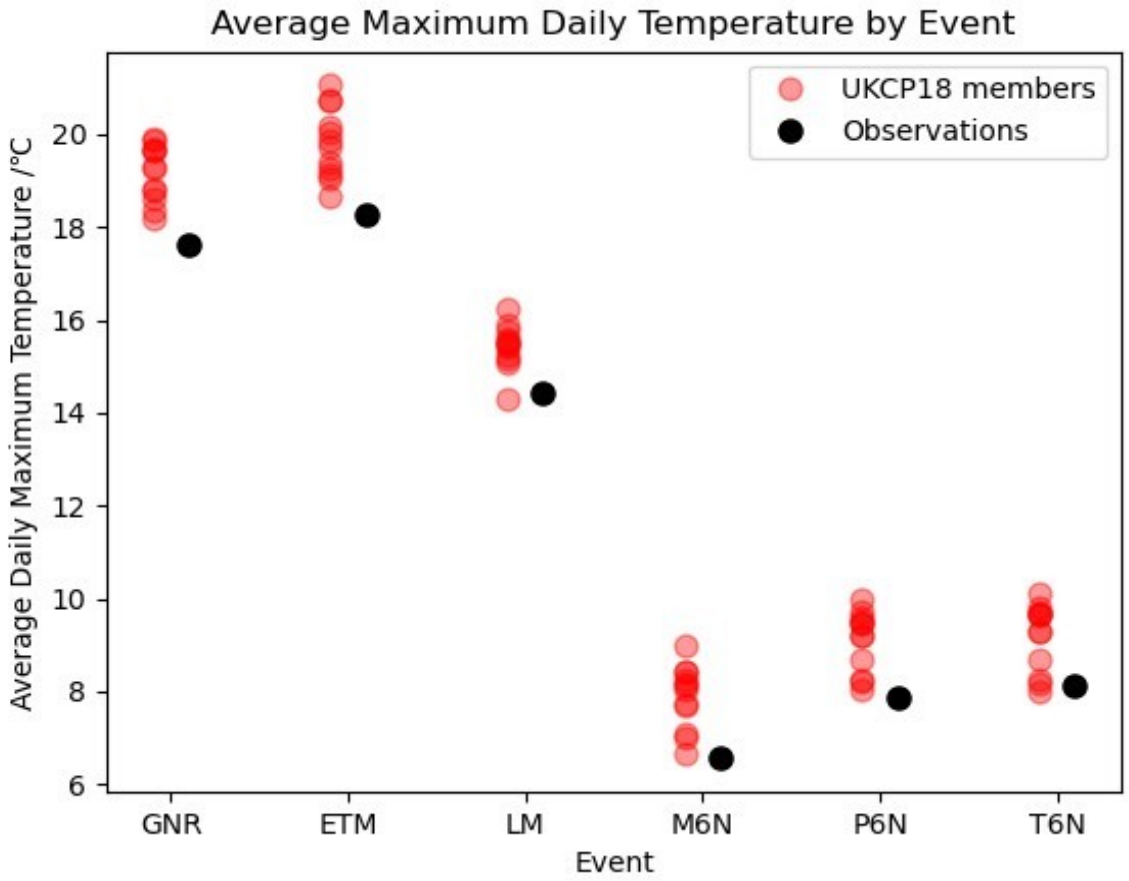
Male runner in marathon race, sweat on his back.

How the study was carried out

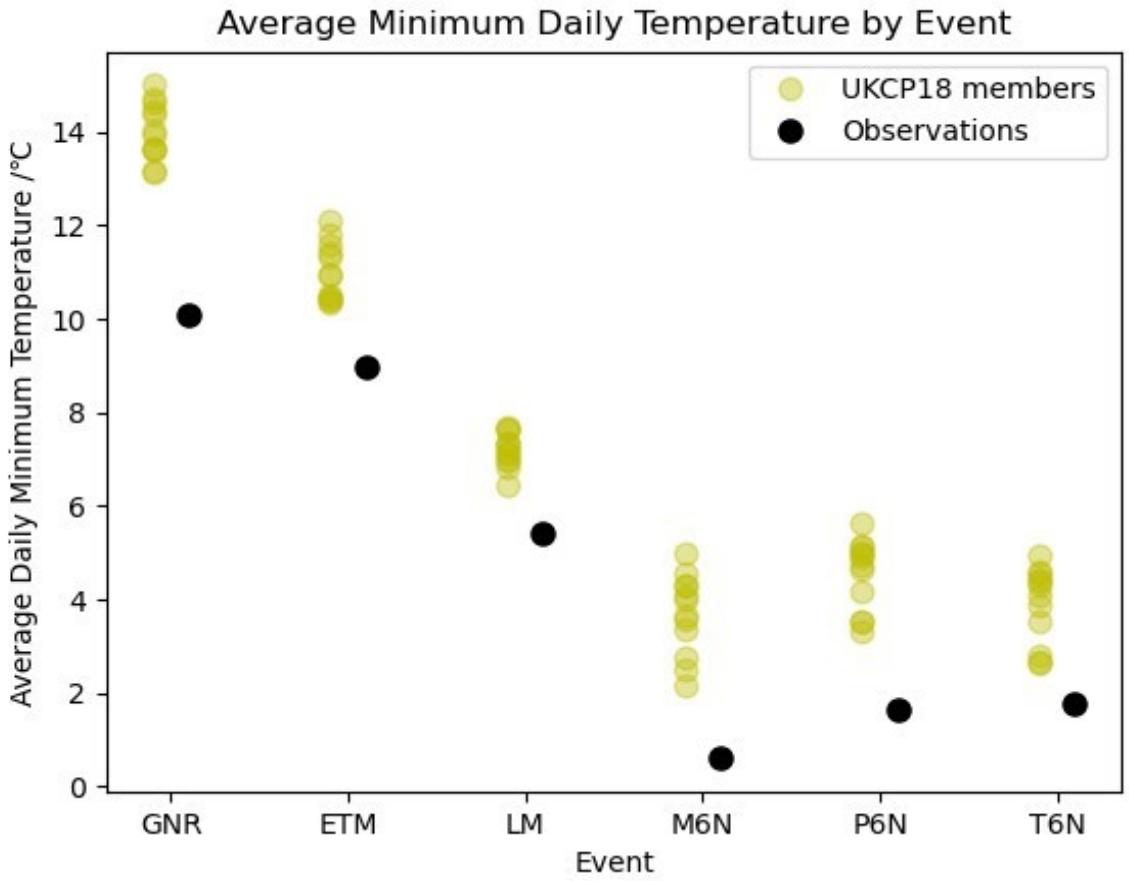
For the analysis of this work, the dates the chosen events took place on over the last 20 years were used to create a window of plausible dates for the event (assuming the organisers continue with these timings). To understand the historic observed climate of the events, HadUK-Grid data (at 12km resolution) was used, and the 1980-2010 time frame was selected to form the baseline period. For the future projections, bias corrected UKCP18 Regional data (12km resolution) was used covering 2040-2060. The analysis uses all 12 of the ensemble members available to explore the full range of uncertainty available within the UKCP18 Regional data. The projections data models a high emission (RCP8.5) future.

Key results and common themes

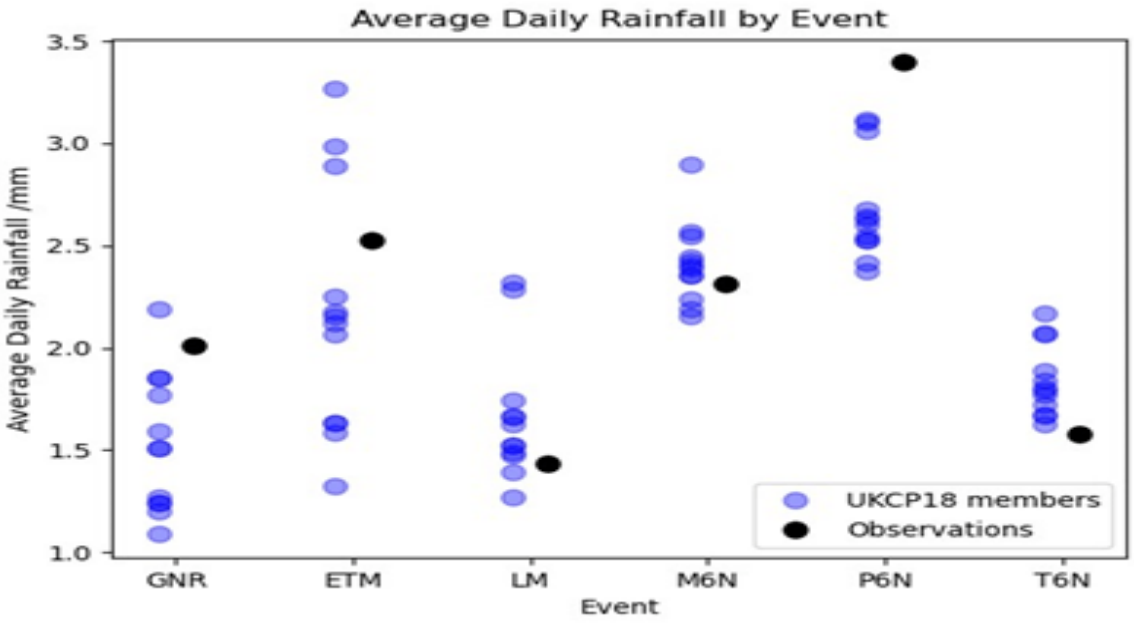
Let’s begin by having an overall look at the results from across all the events analysed. Although the events are spread across all four seasons, some common trends can be seen. The three plots in Figure 1 compare the average values from observations with the average values from future projections for maximum daily temperature, minimum daily temperature, and daily rainfall, respectively. Each of the colourful dots represents one of the twelve ensemble members which make up the UKCP18 Regional projections.



Plot 1: Average maximum daily temperature



Plot 2: Average minimum daily temperature



Plot 3: Average daily rainfall

Figure 1: Dot plots comparing the observed average and the projected future average (from 12 ensemble members) for each event for three climate metrics: maximum daily temperature (Plot1), minimum daily temperature (Plot 2) and daily rainfall (Plot 3). The labels on the horizontal axis correspond to the events as follows: Great North Run (GNR), the first Test match at Edgbaston (ETM), the London Marathon (LM) and the start of the Six Nations at Murrayfield (M6N), Principality (P6N) and Twickenham (T6N).

In Plot 1, average maximum daily temperature, we see that across all the events, the observed average maximum daily temperature (the average value of the highest temperature recorded each day in the grid squares surrounding the event location) is either less than or at the very lower end of the projected future values for this metric. This means that it is likely, under this high emission scenario, that the peak temperatures for these events in the 2050s will be higher than those we are used to. While this may not be an unwelcome change for rugby fans spectating at the Six Nations, these increases may make for an unpleasant experience for the masses taking part in the Great North Run and London Marathon.

In Plot 2, minimum daily temperature, a similar, but more pronounced, trend is evident when we look at the average minimum daily temperature. This time for all events the average observed minimum temperature is cooler than those projected by all the ensemble members. This shows that we can expect to see increases in the daily minimum temperature for all the events, no matter the season. In some cases, the difference between the coolest projected average and the observations is over 1 degree and in the case of the Great North Run this difference is over 2 degrees.

The average rainfall shown in Plot 3, presents a much more varied picture, this reflects the high natural variability of rainfall in the UK. It is only at Twickenham and Principality during the Six Nations where the average observed rainfall between 1980 and 2010 does not fall in the range of the projected

rainfall for the 2050s. Despite these both being part of the Six Nations and hence taking place at the same time, the data projects conditions will become drier on average at the home of Welsh Rugby while its English counterpart can expect wetter conditions on average. For the first Test at Edgbaston and for Murrayfield during the Six Nations, there is no clear change in the average daily rainfall evident in the data as some ensemble members project more rainfall while others project less than is historically observed.

How might extreme conditions affect our collective experiences of the sports we love?

While these average values reveal some interesting results, they tell us little about the more extreme weather we may encounter. Often it is these extreme conditions which are likely to seriously affect our collective experience of these events.

To explore this further, we will look at the 5th and 95th percentile values for the daily maximum temperature and daily precipitation for some of the events, again comparing the values from observations with those from the projections (taking the median of the 5th or 95th percentile values from all the individual ensemble members).

Maximum daily temperatures

Table 1 below, shows that the expected increases in the 5th percentile values across the events varies from 1.5°C to 2.6°C and for the 95th percentile the increases range from 0.5°C to 1.7°C. Regarding maximum daily temperatures, it is likely to be these more extreme high-end temperatures which are of interest to people participating in the chosen sporting events. The largest increase of 1.7°C in the 95th percentile value is for the London Marathon, and with tens of thousands of people pushing their bodies to complete the marathon, this increased chance of experiencing temperatures over 22.3°C will only add to the challenge.

This is likely to cause concern for organisers as they work to ensure the safety of the participants in increased temperatures and face challenges like running out of water at the water stations as happened when high temperatures were recorded during the 2018 London Marathon. It may also mean we are less likely to see some of the weird and wonderful fancy dress we have become accustomed to as participants get advised to consider the safety of their costumes in higher temperatures (see above linked article).

	Daily maximum temperature/ °C					
	Observation		Projection		Change	
	5th percentile	95th percentile	5th percentile	95th percentile	5th percentile	95th percentile
Great North Run	13.6	21.8	16.1	23.0	+ 2.5	+ 1.2
Edgbaston first Test	13.3	25.1	14.9	26.2	+ 1.6	+ 1.1
London Marathon	9.0	20.6	10.5	22.3	+ 1.5	+ 1.7

Six Nations-Murrayfield	1.7	11.1	4.0	12.1	+ 2.3	+ 1.0
Six Nations-Principality	2.0	11.9	4.6	12.7	+ 2.6	+ 0.8
Six Nations-Twickenham	1.9	13.1	3.8	13.6	+ 1.9	+ 0.5

Table 1: Table comparing values from observation and projections for the 5th and 95th percentiles of daily maximum temperature for each of the sporting events chosen.

Runner in fancy dress wig.

Daily Rainfall

The largest change in the 95th percentile value, representing the more extreme rainfall, is seen in Table 2 below, to be at the Six Nations at Principality. Here there is projected to be a significant decrease of 5mm from 16.3mm to 11.3mm. This reduction in volume of rainfall expected on more extreme rainfall days may make many people's experiences of watching the Six Nations more pleasant and may also make the groundsmen less concerned about their pitches flooding.

	Daily rainfall 95th percentile/ mm		
	Observation	Projection	Change
Great North Run	10.7	5.8	-4.9
Edgbaston first Test	12.2	9.7	-2.5
London Marathon	6.7	6.6	-0.1
Six Nations- Murrayfield	10.2	9.9	-0.3
Six Nations- Principality	16.3	11.3	-5.0
Six Nations- Twickenham	7.4	8.3	+0.9

Table 2: Table comparing values from observation and projections for the 95th percentiles of daily rainfall for each of the sporting events chosen. For both observations and projections, all events had a 5th percentile value of 0.0 mm.

Understanding changes in extremes, to be better prepared

The analysis demonstrates that the climate of the UK is expected to experience significant changes and these changes need to be understood so we can be prepared for them.

The projected decreases in both extreme and average rainfall during February at the Principality stadium that we have seen from this work are clear demonstrations of some of the variability we should expect under climate change. While it is true that for the UK as a whole, UKCP18 data projects warmer, wetter winters and hotter drier summers, there is much variation across the country and indeed we have seen that rainfall in some places during February (a winter month) may decrease. In all the events analysed here, we have seen a projected increase in average daily minimum and maximum temperatures.

It is clear from this work that the increase in global temperature is changing the climate of the UK in a variety of ways and these changes will be reflected in the climatic conditions of popular sporting events across the country. Some of these changes may benefit certain events, while others certainly won't, but either way it is likely that our collective experiences of a number of popular sporting events will be altered in the coming decades due to increased global temperature.

UK Climate projections can be found on the Met Office Climate Data Portal, with improved access to climate data and other resources, organisations can better understand and respond to climate change. Find out more in our news release.

Date Created
July 2024

Sea ice loss remains a serious issue

Description

The Met Office has just published its latest briefing on Arctic and Antarctic sea ice.

The update doesn't reveal any record-breaking figures, but it does reveal that sea ice loss remains a serious issue.

Alex West who co-ordinates the sea ice briefings said: "After last year's record-breaking minimum extent of sea ice in the Antarctic, the latest update shows greater sea ice extent than last year, but it is still the second lowest on record for the time of year.

Following a warm June, Arctic sea ice extent is below average for the time of year but some way above record low levels, with conditions fairly typical of recent years.

"Extent is particularly low in the Laptev Sea and in the Atlantic sector, but nearer average in other parts of the Arctic.

"This year's September Arctic sea ice extent is likely to be well below average, but there are not yet heightened indications of a new record low."

See here for the full briefing.

Arctic insights

The Advancing Arctic Capabilities programme – a new project led by the Met Office -brings international partners to develop an improved understanding of what is happening to the region's ice, ocean and atmosphere to support global climate resilience.

The project will deliver cutting-edge insights into Arctic weather patterns and ocean currents.

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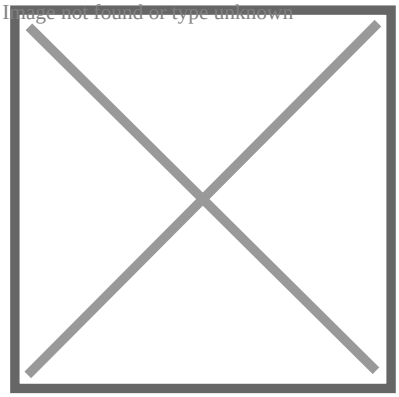
July 2024



What’s happened to summer so far?

Description

With more settled and warmer weather finally in the forecast later this week for some (albeit briefly), there’s been plenty of speculation on the seemingly dreary summer weather so far.

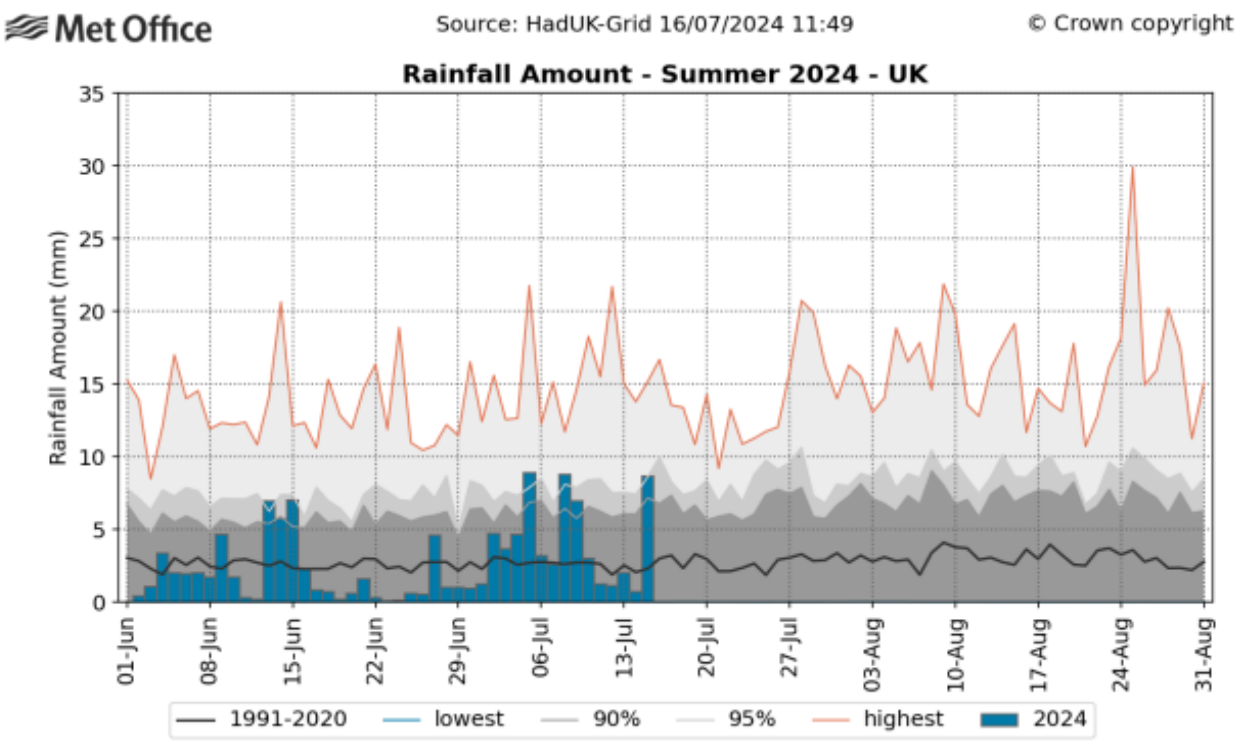
At the halfway point of meteorological summer, we explore if it has been as cool, cloudy and wet as many people think?

Average rainfall, with wet spells for some

Early provisional Met Office statistics for 1 June to 15 July say the summer so far has actually been slightly drier than average. 113.8mm of rain has fallen across the UK, which is 45% of the long-term meteorological average for the whole of the season. At this point, you’d expect 49% of the total to have fallen.

There are of course regional differences, with northern Scotland seeing 57% of its long-term meteorological average compared to Wales, which has seen 37%.

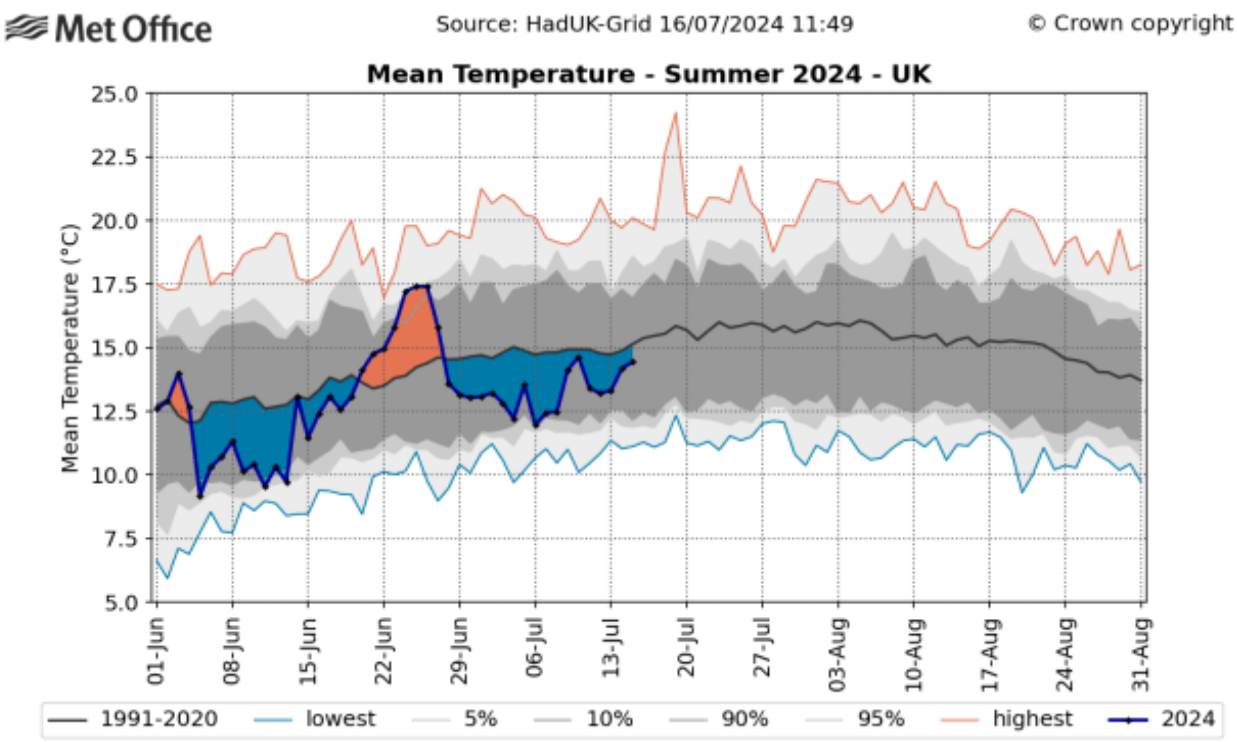
In terms of rainfall, June 2024 was actually quite dry, with only northern Scotland exceeding its average rainfall. But July 2024 has been wet so far, with areas of the southwest, southeast and northeast England having already received more than their average rainfall for the whole of July. Indeed, the UK has recorded 58.7mm, 71% of its long-term meteorological average for the whole of July. At this point in the month you’d expect to have had 48% of the average rainfall.



Cool weather for many

Although a few places reached heatwave conditions back at the end of June, summer 2024 so far has been cooler than average. At the time of writing, the mean temperature in the UK stands at 13.04°C, which is 1.55°C cooler than the long-term meteorological average for the summer reason.

July 2024 has continued June's theme of cooler than average weather, with temperatures persistently below average across the UK for the first part of the month.



So how does this compare to previous mid-summer stats?

It's important to remember that we are now only halfway through meteorological summer. We still have the second half of July and August to go, and summer weather can sway statistics in short periods of time.

Things can change quickly when it comes to summer rainfall, with short heavy bursts quickly pepping up totals and a few very hot days can bring average temperatures up quickly.

Looking back at previous statistics from this time period (1 June to 15 July) in a daily series from 1960, the lowest mean temperature recorded in the UK was 11.22°C back in 1972.

The lowest 12 average temperatures for the period were all recorded before the year 2010, with the start of summer 2012 being the coldest in the 21st century at 12.77°C. The mean temperature of 13.04° C in 2024 stands as the 17th coolest start to summer.

Rainfall data (in a series from 1891) shows that with 113.8mm of rain for the UK so far, summer 2024 is around average so far for rainfall. The wettest year on record was 2012, which saw 222.3mm of rainfall for this time period, with the driest year in 1921 seeing just 24.7mm fall.

Met Office Scientist Emily Carlisle said: "British summers are highly variable. Some summers are hot and dry, some are cold and wet. June was a month of contrasts for many, with a cool first half of the month offset by warmth later in the month. Ultimately though, it was cooler and drier than average, with July continuing with this cool theme, which we can see with the cooler-than-average temperatures.

"What we have seen in the first half of July though, has been the addition of more wet weather. Low

pressure across the UK has led to an unsettled start to the month, with several frontal systems bringing bands of rain. This has brought rainfall totals for the season so far up, with summer 2024 actually around average for rainfall, although it may not feel it at the moment."

What's behind the recent weather?

When looking at the underlying patterns behind the UK's weather, the jet stream plays a prominent role and that has been the case in recent weeks, as Met Office Deputy Chief Meteorologist David Hayter explained: "The position of the jet stream, which is a ribbon of air high up in the atmosphere, is often the driving force behind the weather we experience in the UK," said David.

"Just small shifts in the position of the jet stream can lead to big differences in the weather we experience on the ground. In recent weeks, the jet stream has been either directed towards the UK, or shifted further south, which has predominantly brought cooler air over the UK, with frequent incursions of some unseasonable winds and rain.

"For warm weather in the UK in summer, you'd tend to see the jet stream shifted further north, which allows the possibility of warmer air to drift over the UK from the south, though this isn't always the case. Unfortunately for those who like the warmth, we have only had brief periods where this pattern has been present in summer so far."

So is summer coming back?

Despite the drizzly start to Tuesday, there is warmth on the horizon, with temperatures due to rise for many parts of the UK by midway through the week.

Rebekah Hicks, Deputy Chief Meteorologist at the Met Office said: "A change of weather type is on the way over the next 24 hours, with high pressure in the east drawing up warmer air from the continent over the next few days. Although temperature may be near normal in the northwest, it will be turning very warm in the south and east, with maxima of up to 30°C in southeast England on Friday.

"The nights are also expected to be very warm in the southeast on Thursday and Friday, with temperatures potentially staying above 20°C in some places overnight.

"The heat doesn't look to last long though, as a frontal system pushes the warm air away and things turn more unsettled at the weekend."

You can find the latest forecast on our website, on YouTube by following us, on Twitter and Facebook, as well as on our mobile app which is available for iPhone from the App store and for Android from the Google Play store.

Date Created
July 2024

Tackling climate change issues in the future of rugby

Description

Warmer weather, flooding, and droughts are already affecting rugby, but how will the increasing effects of climate change impact rugby in the future?

A new report by World Rugby (the rugby union governing body), has identified six major climate risks which could impact the sport, either directly or indirectly, in the future if action is not taken to increase the sport's resilience against the risks of climate change.

The Climate Change and Rugby report investigated climate hazards across ten countries (Argentina, Australia, England, Fiji, France, India, Japan, New Zealand, South Africa, and the USA), and found there would be significant impacts for each region if global average temperature were to reach levels of +2°C above a pre-industrial level.

The IPCC Sixth Assessment Report (AR6) states that since the Industrial Revolution, the average temperature of the planet has risen by around 1.1°C.

Using a methodology which includes projections alongside observations, research by the Met Office indicates the current global warming level could be as high as 1.25°C. This is a rapid change in terms of our global climate system and is already leading to changes in the extreme weather we experience on the Earth's surface.

Extreme heat days

As global temperatures rise, so do the instances of extreme heat days (days in which the temperature exceeds 35°C). This not only puts rugby players at risk, but fans of the sport too. This has been seen in other sports in the past where matches have needed to be called off because of scorching temperatures. For example, in 2014, play had to be suspended on all uncovered courts for more than 4 hours at the Australian open due to temperatures rising to over 40°C, causing a risk of heat exhaustion or heatstroke for the athletes.

World Rugby's report found that six out of the ten countries they investigated would face ten or more additional days each year where playing rugby would be ill advised or even impossible due to climbing temperatures.

Increased frequency and intensity of droughts

Droughts affect the availability of water, and reduced access to this resource could result in drier, harder and less grassy pitches. The report indicates that dry conditions will reduce the quality of playing surfaces, affecting ball bounce and player movement. This could also increase the risk of players getting injured when athletes tumble onto hard ground. Half of all countries in the study would likely see an increase in the frequency and intensity of droughts, leading to less days where pitches are suitable for use.

Marine submersion and flooding risks

The report shows that rising sea levels pose a threat to stadiums near the coast, while flash floods caused by the increased frequency and intensity of rain pose a threat to both coastal pitches and those further inland. Floods could make stadiums inaccessible for extended periods of time, as even after the water subsides, turf and building structures can be left with substantial damage. Repairing stadiums after flooding can be costly and take a long time. World Rugby says that 11% of the 111 stadiums in the report can expect to see an increased annual submersion risk, while eight out of ten countries studied will face an increase in the frequency and intensity of heavy precipitation and flash floods.

Increased humidity

Increased humidity can cause additional heat-related suffering for athletes, officials, and spectators. Higher levels of humidity can make heat feel more intense and reduce the body's ability to perform certain functions, such as sweating. Additionally, high levels of humidity can cause issues with the health and growth of certain grass varieties that may be used on pitches. The report found that most climate regions will experience periods of higher humidity, impacting the ability to play rugby.

Adaptation

To reduce the impacts of climate change on rugby, some adaptations will need to be made in the future. World Rugby has suggested in their report the development and implementation of individual sustainability plans, to help reduce rugby's environmental impact. As well as this, climate projections will need to be considered when implementing new policies to prepare the game for a changing climate.

In a recent blog, we shared details of a piece of work by the Met Office which explores expected future climatic conditions for a range of range of cultural, sporting and social events across the UK. The study compares observations and climate projections for temperature and rainfall may change in the future for the start of the Six Nations (February) at the Twickenham (London), Murrayfield (Edinburgh) and Principality (Cardiff) stadiums.

Climate change already has, and will likely continue to affect rugby, but with research and the implementation of new strategies and adaptation, risks can be minimised to allow fans and athletes to continue to enjoy the sport.

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July 2024